AMENDMENTS TO THE CLAIMS:

The listing of claims will replace all prior versions, and listings of claims in the application:

LISTING OF THE CLAIMS

1. (Currently Amended) A photolytic apparatus for oxygenating and removing carbon dioxide from a confined volume ~~area~~ comprising:

a photolytic cell having an anode compartment ~~with~~ containing a transparent window or waveguide, an anode ~~with a photo-active~~, and an anolyte flowpath, wherein the anode comprises a conductor layer and a photo-reactive surface having the ability to convert water to oxygen; and[[,]] a cathode compartment with a cathode[[,]] having the ability to convert carbon dioxide, electrons, and hydrogen ~~ion~~ ions into~~to~~ a solid or liquid medium~~, said cathode being connected to the anode~~; and

a light source for providing light photons to said photolytic cell and activating the photo-reactive surface;

wherein the transparent window or waveguide is between the light source and the conductor layer; and the photo-reactive surface is between the conductor layer and the anolyte flowpath.

2. (Original) The apparatus of claim 1, wherein said photo-reactive surface comprises a light-activated catalyst.

3. (Original) The apparatus of claim 2, wherein said light activated catalyst is a metal oxide catalyst comprising anatase (TiO_2), WO_3 or ZnO, combinations thereof, with or without performance enhancing dopants.

4. (Original) The apparatus of claim 1, wherein said light source is an ultraviolet light at 350-500 nm.

5. (Original) The apparatus of claim 2, wherein said light-activated catalyst converts, when photolytically irradiated, water to hydrogen ions, electrons and active oxygen.

6. (Original) The apparatus of claim 5, wherein said active oxygen formed during photolysis is hydrogen peroxide or other forms of oxygen gas precursors.

7. (Original) The apparatus of claim 5, wherein said electrons generated during photolysis are then electrically conducted away to avoid reversal of the reaction.

8. (Original) The apparatus of claim 5, wherein said active oxygen formed during photolysis is converted by a disproportionation catalyst into dissolved oxygen.

9. (Original) The apparatus of claim 8, wherein said disproportionation catalyst is MnO_2.

10. (Previously Presented) The apparatus of claim 1, wherein the carbon dioxide and hydrogen ion are converted to a carbonate solid.

11. (Previously Presented) The apparatus of claim 1, wherein the hydrogen ion is reacted with a substrate to produce a non-gaseous substance.

12. (Original) The apparatus of claim 11, wherein the substrate is an electrochemically reducible compound.

13. (Original) The apparatus of claim 1, wherein the photo-reactive surface comprises a light transparent substrate and a photolytic coating.

14. (Original) The apparatus of claim 13, wherein said photolytic coating comprises a layer of a light activated catalyst which converts, when photolytically irradiated, water to hydrogen ions, electrons and active oxygen.

15. (Original) The apparatus of claim 14, wherein said photolytic coating further comprises a disproportionation catalyst which converts active oxygen to dissolved oxygen.

16. (Currently Amended) The apparatus of claim 19, wherein the anode compartment and the cathode compartment are separated by a membrane.

17. (Original) The apparatus of claim 16, wherein said membrane allows for the flow of hydrogen ions from the anode compartment to the cathode compartment.

18. (Currently Amended) The apparatus of claim 19, wherein the photolytic cell comprises a mesoporous material.

19. (Currently Amended) A photolytic apparatus for oxygenating and removing carbon dioxide ~~and hydrogen gas~~ in order to maintain a proper physiological environment comprising:

a photolytic cell having an anode compartment and a cathode compartment,

(a) said anode compartment having an inlet ~~for receiving an aqueous solution~~, an outlet, an anode conductor, and a photo-reactive surface~~, and an outlet for transporting a dissolved oxygenated solution out of said anode compartment, wherein said photo-reactive surface~~which has the ability~~, upon photo-activation,~~ to convert water in an aqueous solution to dissolved oxygen, hydrogen ions and electrons upon light activation;~~, and

(b) said cathode compartment having an inlet, an outlet, and ~~for receiving carbon dioxide, C_5 pentose, and a catalyst,~~ a cathode conductor ~~for converting hydrogen ions, carbon dioxide, C_5 pentose and catalyst to C_6 hexose, and an outlet for removing the C_6 hexose from the cell and any remaining reactants~~, wherein said cathode conductor is connected to said anode conductor; ~~and,~~

a light source adapted to provide~~for providing light~~ photons to ~~said~~ the photo-reactive surface ~~to initiate a series of chemical reactions that results in dissolved oxygen generation in the anode compartment and C_6 hexose formation in the cathode compartment~~;

an O_2 gas separator having an inlet, a gas outlet, and a liquid outlet;

a gas/liquid contactor having a gas inlet, a liquid inlet, and an outlet;

a carbon source; and

a liquid/solid separator;

wherein the O_2 gas separator inlet is connected to the anode compartment outlet, the O_2 gas separator liquid outlet is connected to the anode compartment inlet, and the O_2 gas separator gas outlet is connected to an associated gas source;

the liquid inlet of the gas/liquid contactor is connected to the carbon source, the gas inlet of the gas/liquid contactor is connected to the associated gas source, and the outlet of the gas/liquid contactor is connected to the cathode compartment inlet; and

the cathode compartment outlet is connected to the liquid/solid separator.

20. (Currently Amended) The apparatus of claim 19, wherein said ~~light~~ photo-reactive surface comprises a layer of a light activated photolytic catalyst.

21. (Currently Amended) The apparatus of claim 20, wherein said light activated photolytic catalyst is a metal oxide ~~comprises~~ comprising TiO_2 (anatase), WO_3, ~~or~~ ZnO, or ~~combination~~ combinations thereof.

22. (Original) The apparatus of claim 19, wherein said light source is an ultraviolet light at 350-500 nm.

23. (Original) The apparatus of claim 19, wherein said photo-reactive surface further comprises a disproportionation catalyst.

24. (Original) The apparatus of claim 19, wherein said photolytic cell comprises a transparent substrate and a photolytic coating comprising a first disposed layer of TiO_2 (anatase) and a second disposed layer of MnO_2.

25. (Original) The apparatus of claim 19, wherein said cell is constructed from mesoporous materials.

26. (Currently Amended) The apparatus of claim 23, wherein said disproportionation catalyst includes at least one of Fe^{II}, Fe^{III}, Cu^{I}, Cu^{II}, ~~Co^{I},~~ Co^{II}, $\underline{Co^{III}}$, Mn^{II}, Mn^{III}, Mn^{IV}, and MnO_2.

27. (Original) The apparatus of claim 26, wherein said catalyst is MnO_2.

28. (Original) The apparatus of claim 20, wherein said light-activated photolytic catalyst converts water into active oxygen.

29. (Original) The apparatus of claim 26, wherein said disproportionation catalyst converts active oxygen to dissolved oxygen.

30. (Original) The apparatus of claim 26, wherein said cell is constructed from mesoporous materials.

31. (Previously Presented) The apparatus of claim 26, wherein said cell is constructed of self-assembled monolayers on mesoporous supports.

32. (Original) The apparatus of claim 19, wherein the anode compartment and the cathode compartment are separated by a cationic membrane.

33. (Previously Presented) The apparatus of claim 1, wherein the carbon dioxide and hydrogen ion are converted to an inorganic or organic carbon based compound.

34. (Cancelled).

35. (New) The apparatus of claim 19, wherein the anode conductor and cathode conductor are located on opposite surfaces of the photolytic cell.

36. (New) The apparatus of claim 35, wherein the anode conductor and cathode conductor are located on opposite walls of the photolytic cell.

37. (New) The apparatus of claim 19, wherein the anode conductor and the cathode conductor are electrically connected to each other.

38. (New) The apparatus of claim 20, wherein the light activated photolytic catalyst further comprises a performance enhancing dopant.

39. (New) The apparatus of claim 1, wherein the confined volume is a breathing space.

40. (New) The apparatus of claim 1, wherein the confined volume is a confined volume of gas.

41. (New) The apparatus of claim 1, wherein the light source emits visible light.

42. (New) The apparatus of claim 1, wherein the light source emits ultraviolet light.

43. (New) The apparatus of claim 1, wherein the cathode is electrically connected to the anode.

44. (New) A photolytic apparatus for oxygenating and removing carbon dioxide from a confined volume comprising:

a photolytic cell having an anode compartment containing a transparent window or waveguide and an anode, the anode comprising a conductor layer and a photo-reactive surface having the ability to convert water to oxygen; and a cathode compartment with a cathode having the ability to convert carbon dioxide, electrons, and hydrogen ions to a solid or liquid medium, said cathode being electrically connected to the anode; and

a light source for providing light photons to said photolytic cell and activating the photo-reactive surface;

wherein the transparent window or waveguide is directly connected to the conductor layer and the light source is located so that the light photons travel through the transparent window or waveguide and the conductor layer prior to reaching the photo-reactive surface.